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## THE *VOLUCELLA BOMBYLANA* GROUP IN AMERICA.

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Among some Labrador Diptera received from the Museum of Comparative Zoölogy for study through the kindness of Mr. Samuel Henshaw, was a form of *Volucella* belonging to this interesting group. The work of identifying this form compelled me to make a study of the entire series, and the following notes are brought together in the hope of creating an interest in the study of this group in America, and possibly showing their commensal relations with the various species of genus *Bombus*, as has been done in Europe.

To ignore the various forms however slight without defining their limits, even though intermediates apparently exist, does not simplify matters in this case. To clearly show their differences and their resemblances to their apparent hosts—the various species of *Bombus*—seems to be the first step to be taken in a provisional study.

The group probably represents a protean species, of common origin, circumboreal in distribution, and representing an extremely interesting case of resemblance or “mimicry” of their hosts, the bumble-bees. If what is true of the European species is also true of the American forms, they offer a fascinating field for research.

In referring to their resemblance to various species of *Bombus*, Verrall in *British Flies*, Vol. 8, page 485, 1901, says:

“This species varies infinitely in the color of the pubescence between the two common forms which I have noticed above; these two forms are so remarkably distinct that nobody would imagine at first that they belonged to the same species, but they are now well known to occur and to pair indiscriminately. The

only pair I ever took in *cop.* belonged to the two extreme forms. There can be but little doubt that the form *bombylans* mimics *Bombus lapidarius*, while the form *plumata* mimics *Bombus terrestris*. It is only natural that with such a remarkable dimorphic species pairing indiscriminately, and mimicking a genus such as *Bombus* in which there are numerous other color forms, various other color variations should frequently occur, and a vast number of these have been described as distinct species or have received varietal names.

“If it be once recognized that all the European species which are densely pilose belong to one species, concerning which I hold no possible doubt, then the synonymical list in this book will answer for itself, though I may add that I possess several specimens of the North American *V. fascialis* Will. and I cannot distinguish any structural distinction, so that I expect both *V. fascialis* Will. and *V. erecta* Walker are also synonymous.”

Verrall further states: “A remarkable instance of this mimicry occurs in one very common species, *V. bombylans*, which (I estimate without accurate observation) imitates *Bombus terrestris* (and its allies) for about 60 per cent., but imitates *B. lapidarius* for about 38 per cent., while the other 2 per cent. may be of almost any *Bombus* coloring.”

Another interesting feature in connection with this matter is that the inquiline bee *Psithyrus rupestris* so closely resembles *Bombus lapidarius* as to be scarcely distinguishable while *P. vestialis* is banded similar to *B. terrestris*. In this country our species of *Psithyrus* closely resembles our species of *Bombus* and no species resembling *P. rupestris* is found here.

From the above we might infer that the typical *V. bombylans* is absent in America because there is no bumble-bee here like the *Bombus lapidarius* of Europe. On the other hand our forms resemble more closely the various species of *Bombus* found here than the European species do. Thus we have forms with segments three to five of the abdomen with entirely black pile, resembling *Bombus pennsylvanicus*, etc., and others with a fulvous band on the third segment resembling *Bombus ternarius*.

Regarding their habits Verrall says: “Probably all the European species of this subfamily are scavengers in the nests of large aculeate Hymenoptera, feeding on the diseased pupæ, etc., but not

parasitic on the living larvæ or pupæ, so that the association is friendly and consequently not resented by the more powerful Hymenoptera; beyond this the scavengers have probably gradually mimicked their hosts in order to obtain the protection afforded by their aculeate powers. Dr. Sharp's observations on the larvæ of *V. inanis*, which live in the nests of *Vespa crabro*, tend to show that the larvæ are welcome scavengers who live on the pupæ which have recently died and who thereby prevent those dead pupæ from contaminating the nest, for which friendly action their imitative coloring may possibly indicate them as friends rather than conceal them as enemies."

Twenty-one specific names are placed in the synonymy by Verrall and twenty-four (including the American *V. evecta*, *sanguinea* and *facialis*) are in the synonymy under *V. bombylans* in the Katalog der paläarktischen Dipteren, 1907.

I have before me seventeen specimens of the European and Asiatic forms and forty-one specimens of the American forms. Specimens from Knight Valley, Cal. (H. Edwards), described as *facialis* Will. cannot be separated satisfactorily from the European forms, *plumata* and *hæmorrhoidalis*. The pile on the pleura is black and the face and front yellow. A male from Alai Mountains, Turkestan, shows the same variation as a specimen from California, the lateral stripe of yellow pile being absent in front of the transverse suture; the face, however, is black and the antennæ slightly darker in the Asiatic specimen. The color of the antennæ used by Bigot in his table (Ann. Soc. Ent., France, July, 1883, p. 79) seems to be of little value in separating the forms as there are apparently all gradations from reddish brown to brownish black. As the typical *bombylans* is not known in America it is perhaps best at present to use *facialis* for the American form and treat all the American forms as independent of the European.

There is a form closely resembling *facialis*, with the dorsum of the thorax black pilose and face yellow, but the pile on the pleura is yellow. It seems to be confined to the northeastern United States and Canada. Before me are specimens from Franconia, N. H. (Mrs. A. T. Slosson), Wales, Me., June 20, 1909, and Lake Aziscoos, Me., July 8, 1916 (C. A. Frost), Red Indian Lake, Newfoundland, July 20, 1906 (Owen Bryant), and Lewisport, Newfoundland, July (L. P. Gratacap). To this form I assign

the name *lateralis*. Types in the Boston Society of Natural History, American Museum of Natural History and the author's collection. These two forms resemble *Bombus terrestris moderatus* and *Psithyrus ashtoni*.

Another form has the dorsum of the thorax more or less black pilose with the middle of the third segment of the abdomen reddish, with long reddish pile. As the latter character applies to *sanguinea* Will., I will adopt that name, although there is apparently a slight discrepancy in the color of the pile on the thorax. This form I have only from the Rocky Mountain region, Silver Lake, Utah, July 16; top of Las Vegas Range, 11,000 feet, end of June (T. D. A. Cockerell); top of range between Sapello and Pecos Rivers, about 11,000 feet, August (T. D. A. and W. F. Cockerell); Banff, Alberta, July 17, 1902 (Amer. Mus. Nat. Hist.). The reddish band across the abdomen suggests a resemblance to *Bombus ternarius*, *B. huntii*, *B. melanopygus*, *B. sylvicola*, etc.

Specimens, which have been referred to *V. erecta* Walker, represent two quite distinct forms, the typical *erecta* has the face black, pile on the dorsum of the thorax entirely yellow and the abdomen with a band of yellow pile at the base and another at the tip of the abdomen, pleura yellow pilose. The other form differs in having only a basal band of yellow, the remainder of the abdomen black. To this form I give the name *americana*. Types in the Boston Society of Natural History and the author's collection. It resembles a number of the more characteristic species of American *Bombus*, including *Bombus pennsylvanicus*, *B. affinis*, *B. bimaculatus*, etc., and *Psithyrus laboriosus*.

Typical specimens of *erecta* are in the collection of the Boston Society of Natural History from Franconia, N. H. (Mrs. A. T. Slosson), North Adams, Mass., June 14, and Sharon, Mass., June 13.

The form *americana* is more widely distributed. Monmouth and Orr's Island, Me.; Hanover, N. H.; North Adams, Great Barrington, Mount Tom, and Auburndale, Mass.; Delaware Water Gap and near Newark, N. J., and Folsom, Pa.

The Labrador specimens represent an interesting form and were it not for the great variation and wide distribution of the group, I would describe it as a new species without hesitancy.

As matters are, however, I prefer to consider it a form for which I propose the name *arctica*.

The male is 12 mm. in length, face black with light yellowish pile, pile on vertex dull yellow, antennæ dark brown, arista brown. Thorax black with black pile, except the post-alar callosities which are yellow with yellow pile, pleura black with black pile, scutellum yellow, with yellow pile. Abdomen black, the second and third segments largely yellow with only a dorsal line of black, all the pile of the abdomen yellow. Legs black, tarsi dark brown. Clouding on the wings slight.

The female is similar to the male. The pile on the front is yellowish and on the entire thorax (except the post-alar callosities) a dull yellow more or less mixed with black, when viewed from above the appearance is black. The yellow markings on the third segment are much smaller or obsolete and the pile on the entire abdomen noticeably thicker and a darker yellow. This species resembles the species of the *Bombus borealis* group.

One male and nine females. Rama "N. of three line," 1898 (J. D. Sornborger); Rama, 1898, 1899 (A. Stecker and J. D. Sornborger); Nain (J. D. Sornborger); Nain, August 18, 1908 (Owen Bryant). Holotype, allotype and six paratypes in the Museum of Comparative Zoölogy, and two paratypes in the author's collection.

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## ON SOME TINGIDÆ FROM NEW ENGLAND.

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In working on the New England Tingidæ I have come across three apparently undescribed forms, which are characterized herewith. The first belongs to the genus *Dictyonota*, not hitherto represented in the American fauna, of which twenty species and one variety are recognized in the Palæarctic region. Some of the species live on the broom and furze, and the naturalization of these plants along our eastern coast may possibly account for the presence of the insect in question, although *D. tricornis* Schrank is not itself recorded as dependent on the plants mentioned.